CLAIMS

1. A thin-film silicon chemical vapor deposition (CVD) system, comprising:

a deposition chamber with an RF-field generator for spawning a hydrogen plasma proximate to a workpiece substrate;

a silane input for injecting a silane gas into said hydrogen plasma during operation;

a dopant input for injecting p-type impurities, n-type impurities, or no impurities into said hydrogen plasma during operation and providing for alternative depositions of p-type, n-type, and intrinsic silicon layers, respectively, on said workpiece substrate;

an exhaust system for removing a deposition gas mixture from the deposition chamber; and

a recirculating system for returning silane gas from said hydrogen plasma back to the silane input;

wherein, such provide for a controlled pressure and a consistent concentration of said silane gas in said hydrogen plasma during operation.

2. The CVD system of claim 1, further comprising:

a controller for admitting silane and impurity dopant gases at their respective inputs at a rate that matches their consumption from said hydrogen plasma during deposition.

3. The CVD system of claim 1, further comprising:

a controller for exhausting the gas mixture in the chamber at the rate that matches the rate at which reaction products are generated in the deposition process.

4. The CVD system of claim 3, further comprising:

a filter that concentrates hydrogen place before the exhaust to further prevent input gasses from being exhausted from the chamber and wasted.

5. The CVD system of claim 1, further comprising:

a sensor for continuously monitoring said deposition gas mixture in the deposition chamber, and for providing a feedback signal that can be used to maintain a particular pressure and a specific concentration of reaction gasses.

6. The CVD system of claim 1, further comprising:

a feedback control system that receives inputs from sensors that measure pressure, gas concentrations, gas temperature, RF power level, and that adjusts a gas input and a gas exhaust rate, an RF-power level, and a gas temperature to maintain particular deposition conditions.

7. The CVD system of claim 1, further comprising:

multiple chambers with different gas mixtures in each chamber separated by baffles or buffer regions to minimize the flow of gas from one chamber to the next.

8. A method of thin-film silicon chemical vapor deposition (CVD), comprising:

spawning a hydrogen plasma proximate to a workpiece substrate in a deposition chamber with an RF-field generator;

injecting a silane gas into said hydrogen plasma during operation from a silane input;

injecting p-type impurities, n-type impurities, or no impurities into said hydrogen plasma during operation which provides for alternative depositions of p-type, n-type, and intrinsic silicon layers, respectively, on said workpiece substrate;

removing a deposition gas mixture from said deposition chamber through an exhaust system; and

returning silane gas from said hydrogen plasma back to said silane input with a recirculating system;

wherein, a controlled pressure and a consistent concentration of said silane gas is provided for in said hydrogen plasma during operation.

9. The CVD method of claim 8, further comprising:

admitting silane and impurity dopant gases at their respective inputs at a rate that matches their consumption from said hydrogen plasma during deposition.

10. The CVD method of claim 8, further comprising:

exhausting said gas mixture in said chamber at a rate that matches said rate at which reaction products are generated in said deposition process.

11. The CVD method of claim 8, further comprising:

selectively passing only hydrogen with a filter before exhausting said system to prevent silane input gasses from being wasted.

12. The CVD system of claim 8, further comprising:

continuously monitoring said deposition gas mixture in said deposition chamber with a sensor, and providing a feedback signal that can be used to maintain a particular pressure and a specific concentration of reaction gasses.

13. The CVD method of claim 8, further comprising:

providing a feedback control system that receives inputs from sensors that measure gas pressure, gas concentrations, gas temperature, RF power level, and that adjusts a gas input and a gas exhaust rate, an RF-power

level, and a gas temperature to maintain particular deposition conditions.

14. The CVD method of claim 8, further comprising:

separating multiple chambers with different gas mixtures in each chamber by baffles and buffer regions to minimize a bypass gas flow between chambers.